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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/657,799	09/09/2003	Takeshi Takagi	61352-043	1584
7590 12/15/2004 McDERMOTT, WILL & EMERY 600 13th Street, N.W. Washington, DC 20005-3096			EXAMINER CAO, PHAT X	
			ART UNIT 2814	PAPER NUMBER

DATE MAILED: 12/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/657,799

Applicant(s)

TAKAGI, TAKESHI

Examiner

Phat X. Cao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3 and 7-15 is/are rejected.
- 7) ☒ Claim(s) 2 and 4-6 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 9/2003&1/2004.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Specification*

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1, 7-9 and 13-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Hammond et al (US. 6,680,496).

Regarding claims 1 and 8, Hammond (Fig. 3A) discloses a semiconductor device comprising: a semiconductor layer 340/350/360; a gate insulator 318 provided on the semiconductor layer; a gate electrode 310 provided on the gate insulator 318; a source region 325 and a drain region 335, which are of a first conductivity type (column 4, lines

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45-50) and provided in the semiconductor layer on both sides of the gate electrode 310 in plan view; a cap layer 360, a channel region 350, and an under-channel region 340 which are provided in the semiconductor layer between the source region 325 and the drain region 335 in a descending order from an interface with the gate insulator 318, the under-channel region 340 being of a second conductivity type (column 4, lines 45-50); and a bias electrode member Vb for applying a voltage to the under-channel region 340, wherein the channel region 350 is formed of first semiconductor, the cap layer 360 and the under-channel region 340 are formed of a semiconductor and a third semiconductor, respectively, the bias electrode member Vb is capable of applying the voltage independently of the gate electrode Vg (column 5, lines 56-65).

It is noted that "products of identical chemical composition can not have mutually exclusive properties". A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). In this case, because Hammond (Fig. 6B) discloses the channel region is formed of SiGe and the cap layer/under-channel region are formed of Si (also see column 11, lines 7-14), the cap layer/under-channel region of Si inherently have a larger band gap than the channel region of SiGe since these materials have the same materials as disclosed by Applicant.

Regarding claim 7, Hammond further discloses the cap layer 360 (surface layer) has a thickness of 5 nm (column 9, lines 4-10).

Regarding claims 9 and 14, Hammond further discloses the forming of a complementary semiconductor device comprising NMOSFET having n-channel and PMOSFET having p-channel (column 3, lines 21-29 and column 7, lines 1-5).

Regarding claim 13, Hammond further discloses the forming of the semiconductor layer on the substrate of silicon-on-insulator (SOI) (column 6, lines 45-50).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 3, 10-12 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hammond et al (US. 6,680,496) in view of Takagi (EP 0 921 575) – cited by Applicant.

Regarding claims 10-11 and 15, Hammond further discloses that the semiconductor device is a NMOS having an n-channel or a PMOS having a p-channel (column 3, lines 21-30). Hammond does not disclose the first semiconductor (channel region) comprising SiGeC.

However, Takagi (Fig. 3) teaches the forming of a semiconductor device having the first semiconductor 13 (channel region) comprising SiGeC (par. [0056]), and the second and third semiconductors 15/12 comprising Si. Accordingly, it would have been obvious to form the channel region or the first semiconductor of Hammond with SiGeC

because as taught by Takagi, such SiGeC channel region would provide more efficiently and more suitable for high-speed operation because it has smaller heterobarrier at the edge of the conduction band and larger at the edge of the valence band (par. [0104]).

Regarding claim 12, it would have been obvious to dope a p type under-channel region with boron because boron is a well known doping for forming an p type conductivity.

Regarding claim 3, it would have been obvious to dope the under-channel region with an impurity concentration as claimed because the impurity concentration of the under-channel region can be optimized depending upon the impurity concentration doping of cap layer and the channel region.

***Allowable Subject Matter***

6. Claims 2 and 4-6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record fails to disclose a rate of change in a threshold voltage relative to a change in the voltage applied to the bias electrode member as claimed.


7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (571) 272-1703. The examiner can normally be reached on Monday - Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PC  
December 10, 2004

  
PHAT X. CAO  
PRIMARY EXAMINER